

PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Automatic Drill Pipe Control Valves.



I, BERNARD HENDRY SCOTT, Petroleum Engineer, of 646, North Maryland Avenue, Glendale, State of California, United States of America, a citizen of the United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

My invention relates to Automatic Drill Pipe Control Valves, and more specifically to valve mechanism located in a tool joint in such a way that it in no way interferes with the regular opening through said tool joint and which will be automatic in its action for closing said opening through an open tool joint in case a well in which it is located commenced to flow or in case of blowout through the drill pipe.

Among the salient objects of my invention are: to provide in combination with a tool joint a valve mechanism wherein a valve can be held open under normal conditions and which will automatically close in case of flow or blowout through the drill pipe; to provide such a mechanism which is automatically opened and held open when the two parts of a tool joint are screwed together and which automatically closes when the pin end of a tool joint is removed therefrom; to provide in a tool joint a recess outside of the regular passageway through the joint in which a valve can be positioned and adapted to move across said passageway in order to close the same, with a tubular member or sleeve which is operable to move said valve into said recess, said tubular member or sleeve forming the normal passageway through the joint; to provide a mechanism of the character referred to which can be embodied in an intermediate member to be interposed between the two parts of the standard tool joint, or which can be embodied in the box end of the standard tool joint; to provide in combination with a mechanism of the character referred to a connecting device which can be substituted for the pin end of a tool joint for the purpose of connecting the drill pipe with a pipe line,

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said connecting device having means for opening the valve when in place, whereby to open the drill pipe into communication with a pipe line, thus making it possible to accomplish the connection of a drill pipe with a pipe line without opening the valve and thereafter to open the valve and permit any flow from the drill pipe to the pipe line.

Other advantages and objects of my invention will be recognized from the following description of one practical embodiment thereof, shown on the accompanying two sheets of drawings which I will now describe.

Figure 1 is a longitudinal sectional view through an intermediate member embodying my invention, the valve being shown in full lines, and indicated in open position in light broken lines;

Figure 2 is a similar view showing a tool joint with the valve mechanism embodied in the box end of said tool joint, the valve being shown in the open or inoperative position in full lines; and

Figure 3 is a similar view showing the valve-containing member with the connecting member being screwed into place and valve-opening part thereof partially screwed down and the valve partially open.

Referring now to Fig. 1, 5 designates the box end of a tool joint, 6 an intermediate member having a pin end 7, having the coarse threads 8 used for quick action, and the close fitting shoulder 9. At its upper end, said intermediate member 6, is provided with the tapered, coarse threaded end 10, to receive the pin end of another joint member 11, indicated in light broken lines, and on its interior said member 6 is provided with a threaded section 12, and with an annular enlargement 13, of substantially the form shown.

An externally threaded bushing 14, is internally threaded at its lower end, as at 15, and into the end of said bushing is screwed a valve seat member 16, having a clapper valve member 17, hinged thereto at 18, and adapted to close on said valve seat member 16, in the manner indicated in full lines, Fig. 1, or to swing back into

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the annular recess or space 13, as indicated in light broken lines. Said valve member has a spring 19 thereon adapted to normally move said valve outwardly far enough so that any upflow through the drill pipe would close it. Mounted to move in the bushing 14, is a sleeve or tubular member 20, provided with slots 20¹ to receive pins, as 21 from the bushing, whereby said member 20 can move within certain limits, as indicated in light broken lines, and when forced down, it operates to force the valve member open and back into the annular recess in which it is shown in light broken lines. In its upper position, shown in full lines, said tubular member or sleeve is in position to be engaged and moved downwardly by the pin end of a tool joint screwed into the upper end of said intermediate member 6 as indicated in light broken lines.

Referring to Fig. 2, I have shown my improved valve mechanism embodied in the box end of a tool joint. The box is designated 22, having the usual pipe receiving threads at 23, to receive a section of drill pipe 24, and at its upper end, said box has the usual tapered, pin-receiving end 25. Said box 22 is shown provided internally with a threaded section 12¹ to receive a bushing 14¹, which bushing is internally threaded at its lower end, as at 15¹, to receive a valve seat member 16¹, with clapper valve 17¹, hinged therein at 18¹, and shown swung back into the annular recess 13¹, in said box 22, and held there by means of a sleeve or tubular member 20^a, which is shown moved to its down position by the pin end of the tool joint shown in place therein. The valve is provided with the spring 19¹. The sleeve member 20^a is also shown in its down position, with its limit slot 20^b and stop pin 20^c. These parts are all similar to the parts in Fig. 1, and are designated with the same numerals provided with the prime point, or with small letter exponent.

When the pin end of a tool joint is unscrewed to disconnect a section of drill pipe, it will be seen that the spring 19 or 19¹ will operate to move the valve outwardly and raise the sleeve 20^a to its up position, as shown in Fig. 1, thus the valve automatically closes when the pin end of a drill tool joint is removed and it is automatically opened as the pin end of the joint is screwed into the upper end of the intermediate member in Fig. 1, or the upper end of the box member in Fig. 2. The principle is the same and the operation is the same.

The two members of a tool joint which are screwed on to the ends of the drill pipe frequently become so tightly locked

thereto that they cannot be removed and in order to make it possible to take advantage of my invention in connection with standard equipment, I have suggested the intermediate member, complete in itself, and adapted to be interposed between the two regular members of a tool joint. In new equipment, the invention can be embodied in the box end of the standard tool joint and thus every tool joint would be equipped with the means for automatically closing the passage through the drill pipe and the joint, so that when a joint was disconnected, the valve in that joint would automatically close, as before described.

It will be understood, of course, that the passage through the drill pipe must be kept open and of uniform size and there can be no constrictions or obstructions therein which would obstruct the passage of the circulating fluid there-through. My invention makes provision for automatic valve mechanism and at the same time keeps the passage of smooth and uniform size through the joints and the drill pipe.

Referring to Fig. 3, I have shown a connecting mechanism for quick attachment to a tool joint in place of the pin end of a joint member and which can be attached thereto without causing the opening of the valve, as in the case when the standard pin end of a coupling member is connected with the box end or the corresponding end of the intermediate member. This connecting mechanism has means therein which can be operated after the coupling has been made for forcibly opening the valve.

In the drawings, the valve containing member, whether it be a regular box end of a coupling member, or an intermediate member as previously described, is designated 6, corresponding with the general construction in Fig. 1, and I have also used the same reference numerals as used in Fig. 1 for the valve mechanism and related parts. The upper end of the valve containing member has the tapered, coarse threaded end 10, to receive the pin end of a joint member, or other correspondingly tapered and threaded member. The bushing 14, the valve seat member 16, the valve 17, the spring 19, are all shown in Fig. 3, also the sleeve 20.

Assuming now that when a section of drill pipe was disconnected from the member 6, which would be on the upper end of the drill pipe in a well, that there was a flow, or blow out which held the valve member 17 closed. To connect another section of drill pipe thereto would open the valve and allow the flow to pass up through the added section and if it had no

valve at its upper end, it would blow out into the atmosphere. To take care of this situation, I have provided a special connecting member for connecting the drill pipe in the well with a pipe line and after the connection, to open the valve and permit the flow therethrough.

This connecting member comprises a body 26, having at its lower end a pin end, tapered and coarsely threaded at 27 to couple with the member 6, and having a fitted shoulder at 28 to rest upon the upper end of said member 6, said body member having a branch pipe connecting opening at 29, with which a pipe line 30 is connected. Within said body is a plunger member 31, with bore thereto from its lower end, as indicated at 31¹, with outlets 32, 32, through its side, near its upper closed end. The diameter of said plunger member is reduced, as at 33, at a location which includes the outlets 32, and also in register with the connecting opening 29, as indicated. The lower end of said plunger member is adapted to engage the upper end of the sleeve 20. The pin end, or the tapered end of said body, has a larger internal diameter than the coupling member, so as not to engage said sleeve 20, when screwed thereto. The upper end of the body 26 is reduced in diameter and internally threaded to receive therein a screw plug 34, which is also internally threaded and screwed on to the upper reduced end of the plunger member 31, as at 35, said screw plug 34 having a head 34¹ adapted to receive a wrench or other operating tool, whereby it can be turned together with the plunger down into the body 26, for forcing said plunger downwardly sufficiently to engage the sleeve 20 and move it down to open the valve 17. It is shown partially down in the drawing, Fig. 3, and the valve partially open. When it has been sufficiently screwed down to open the valve 17 fully and position the sleeve over the valve member, I have provided a cap 36 adapted to screw onto the upper end of the body 26, and over the screw plug head 34¹ as clearly illustrated.

Thus the drill pipe is connected with a pipe line 30, and the valve 17 has been forced open and the upper part of the body is securely closed and any flow of gas or oil is out through the pipe line 30, as will be understood from the showing made.

In operating a rotary drilling unit, it becomes necessary to remove the drill pipe from the hole at frequent intervals in order to change drilling bits, or for other purposes. As this is accomplished, it is not infrequent that a well starts producing or to flowing while these drill pipe

sections are being withdrawn, and due sometimes to the lowering of the mud fluid level in the well as the displacement represented by the drill pipe volume decreases. While the drill pipe is being pulled out of the well there is an open tool joint at all times, either at some point in the derrick or at the derrick floor. It will be seen, therefore, that when one of my automatic valve joints at each tool joint connection, the well would be fully protected from premature blowouts through the drill pipe, or to flow out of control through the drill pipe, as has occurred on many occasions.

I do not limit my invention to the details of construction and arrangement shown, realizing that many changes can be made therein without departing from the spirit of the invention, and it is my intention that any embodiment on which the hereto appended claims can fairly be read shall be considered as another embodiment of the invention.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. A drill pipe control, including a valve adapted to close the passage way through the pipe but movable outward into a recess of the pipe to open the passage way, a member permanently housed within the pipe string and adapted to be moved to engage and open said valve by moving it into the recess and holding it there and means automatically operative upon releasing said member for moving the valve out of the said recess to a position in the fluid stream whereby the valve is moved to its closed position.

2. A drill pipe control, as set forth in claim 1, wherein the member operable to effect movement of the valve from passage way closing position to the recess is a tubular member permitting the flow of fluid therethrough and is mounted in the pipe string so as to be movable endwise therein.

3. A drill pipe control, as set forth in claim 1, including a joint member for the pipe string adapted to engage and move the valve control member to a position in which said valve control member effect the movement of the valve to opening position.

4. A drill pipe control, as set forth in claim 1, including a pivotal support for the valve member in one section of the pipe string and laterally of the passage way through the pipe.

5. A drill pipe control, as set forth in claim 1, wherein the automatic means for returning the valve member out of

the recess to passage way closing position upon release by the control member is constituted by a spring acting on said valve member.

5 6. A drill pipe control, as set forth in claim 1, including in the pipe a valve seat member, the passage way through the valve seat member corresponding in size to the passage way through the pipe
10 and the valve control member being movable through the valve seat member to engage and move said valve member back into the recess of the pipe.

15 7. A drill pipe control, as set forth in claims 1 and 4, in which the pivotal connection for the valve member is located in the recess of the pipe to permit the valve to swing back into the recess upon actuation by the valve control member.

20 8. A drill pipe control, as set forth in claim 3, wherein the member for actuating the valve control member is a connecting element adapted to be coupled to the pipe, said connecting element having
25 a provision for a pipe connection through its side, and containing a plunger which acts as element for actuating the valve control member.

30 9. A drill pipe control, as set forth in claim 8, including means for forcing the plunger inward to engage the valve control member for actuating the same to open the valve and means for closing the connecting element for the pipe at its
35 outer part.

10. A drill pipe control, as set forth in claims 8 and 9, including in the connecting element screw means for actuating the plunger thereon, said screw means closing the outer end of the connecting element and the connecting element having
40 a lateral outlet threaded to receive a pipe.

11. A drill pipe control, as set forth in claims 8 to 10, including a second coupling member adapted to couple to the first mentioned connecting element the plunger extending to the second coupling member for engaging and moving the valve control member when the coupling member and connecting elements are
45 coupled together, and including means for closing the outer end of the second coupling member, said means being adapted to operate the plunger.

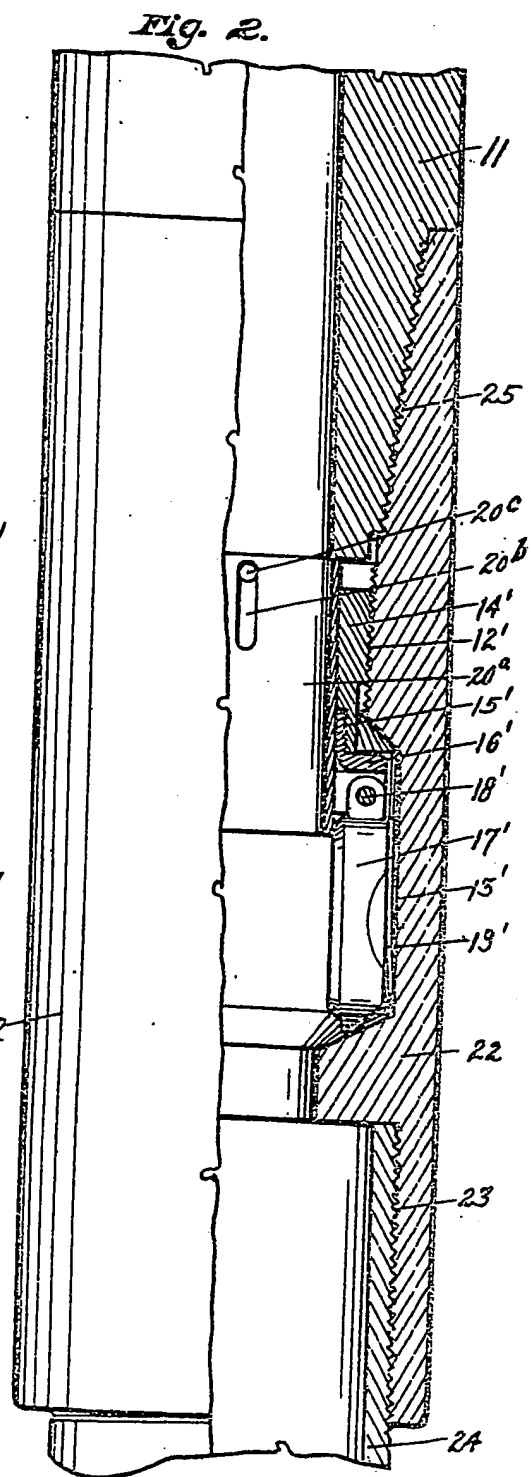
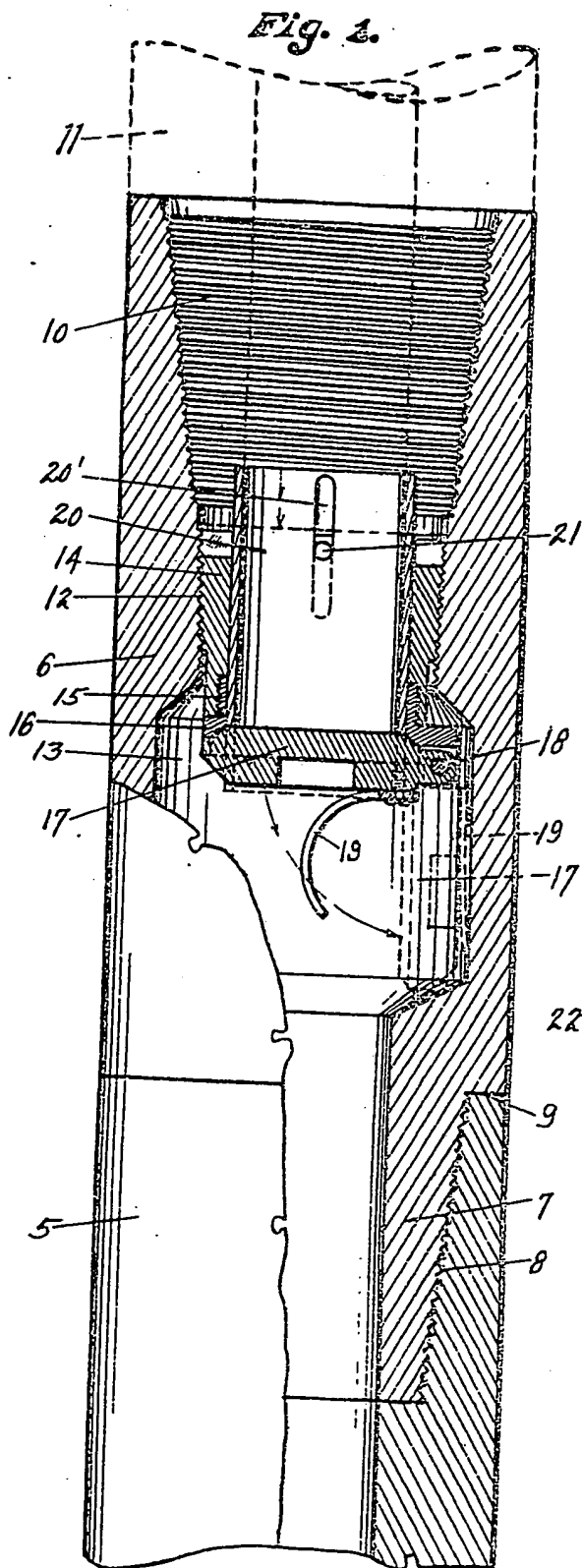
12. A drill pipe control, substantially as described and shown with reference to Figures 1 and 2, and for the purpose set forth .

13. A drill pipe control, substantially as described and shown with reference to Figure 3, and for the purpose set forth.

Dated this 23rd day of July, 1929.

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[This Drawing is a reproduction of the Original on a reduced scale.]



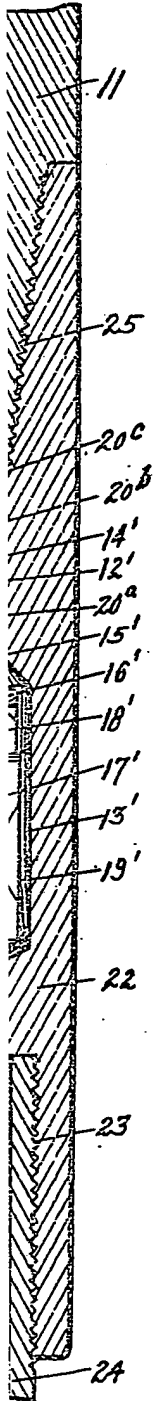
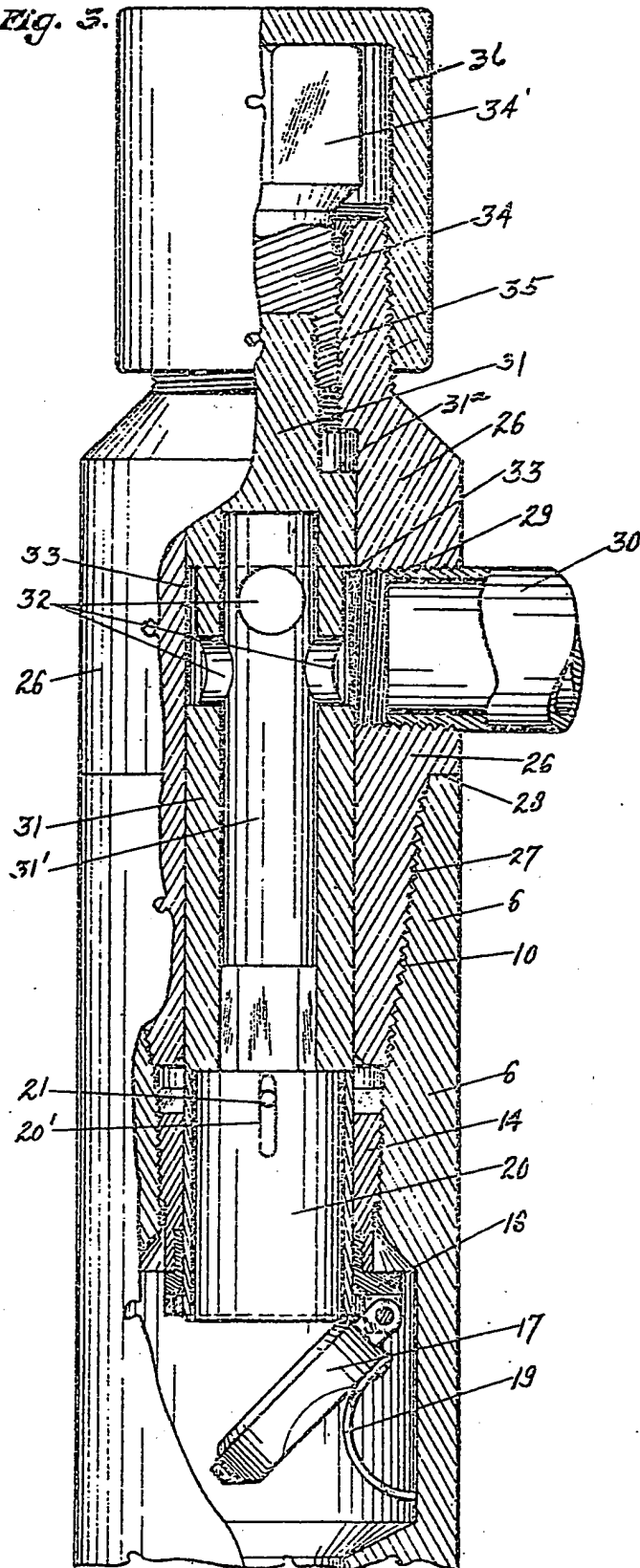
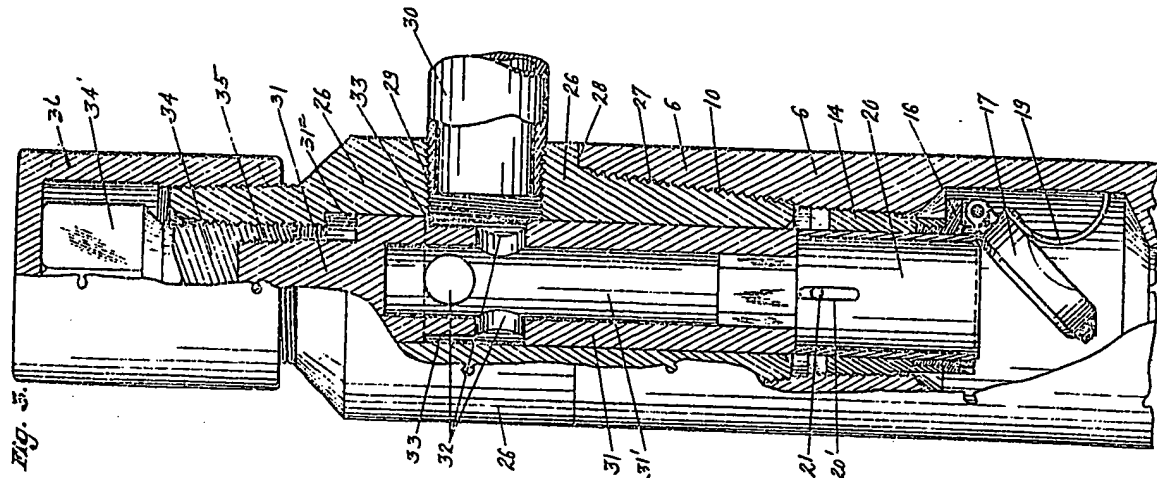
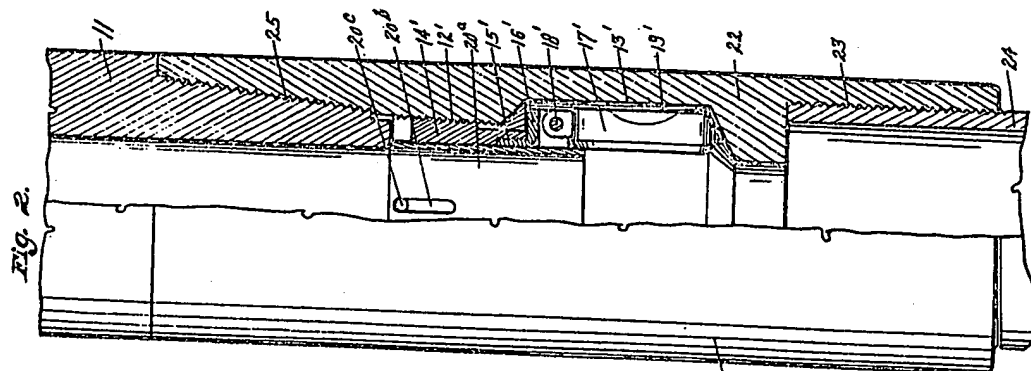
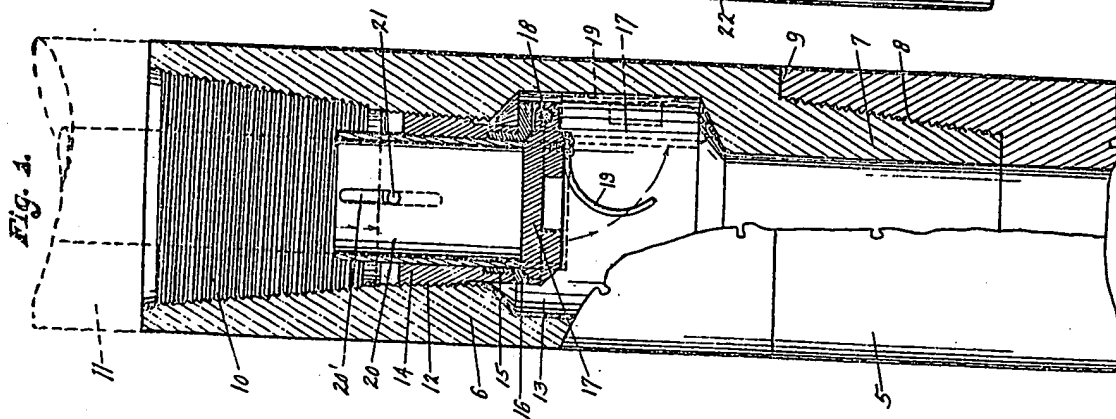


Fig. 3.



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